GUJARAT TECHNOLOGICAL UNIVERSITY ME - SEMESTER–I(New course)• EXAMINATION – WINTER- 2015

Subject Code: 2710502 Date: 04/01				
Tii Inst	Time:2:30 pm to 5:00 pm Total Mark			
	1. 2. 3.	Attempt all questions. Make suitable assumptions wherever necessary. Figures to the right indicate full marks.		
Q.1	(a)	A binary channel matrix is given by Outputs Inputs $ \begin{array}{c} x_1 \\ x_2 \\ x_2 \\ x_2 \\ x_2 \\ x_2 \\ x_3 \\ x_3 \\ x_2 \\ x_3 \\ x_2 \\ x_3 \\ x_3 \\ x_3 \\ x_2 \\ x_3 \\ x_4 \\ x_3 \\ x_3 \\ x_4 \\ x_3 \\ x_4 \\ x_3 \\ x_4 \\ x_5 \\$	07	
	(b)	 H(Y/X) and I(X;Y). State, prove and highlight importance of following: (i) Kraft's Inequality (ii) McMillan's Theorem 	07	
Q.2	(a) (b)	 Derive the capacity of a Bandlimited AWGN channel. A source emits one of four messages randomly every 1µs. The probabilities of these messages are 0.5, 0.3, 0.1 and 0.1. Messages are generated independently. (a) What is the source entropy? (b) Obtain a compact binary code and determine the average length of code word, the efficiency, and the redundancy of the code. (c) Repeat part (b) for a compact ternary code. 	07 07	
	(b)	Differentiate unique decodable codes and instantaneous decodable codes. Explain construction steps of IDC.	07	
Q.3	(a) (b)	 (i)Derive Hamming bound. (ii)Define perfect code. (iii)What is code efficiency? (iv)State the condition for t-error correcting code. (v) State the condition for t-error detecting code. Explain cyclic codes in detail. 	03 01 01 01 01 01 07	
Q.3	(a)	 OR Consider the following (k+1,K) systematic linear block code with the parity-check digit C_{k+1} given by C_{k+1} = d₁ +d₂ + + d_k (a) Construct the appropriate generator matrix for this code. (b) Construct the code generated by this matrix for k = 3. (c) Determine the error detecting or correcting capabilities of this code. (d) Show that cH^T = 0, rH^T = 0 if no error occurs and rH^T = 1 if single error occurs. 	07	
	(D)	while short note on DCn code and its decoding.	07	

- **Q.4** (a) Given k = 8 for a linear block code.
 - (i) Find the minimum value of n for a code that can correct at least one error.
 - (ii) Choose a generator matrix G for this code.
 - (iii)How many double errors can this code correct?
 - (iv) Construct a decoding table.
 - (b) A three error correcting (23,12) Golay code is a cyclic code with a generator 07 polynomial

 $g(x) = x^{11} + x^9 + x^7 + x^6 + x^5 + x^1$

Determine the code word for the data vectors 000011110000, and 101010101010.

OR

Q.4	(a)	Consider a (6,2) code generated by the matrix	07
		(i) Construct the code table for this code and determine the minimum	
		distance between code words.	
		(ii) Prepare a suitable decoding table.	
	(b)	With a suitable example explain Viterbi decoding algorithm.	07
Q.5	(a)	With a suitable example explain Wozencraft sequential decoding algorithm.	07
	(b)	Explain arithmetic coding in detail.	07
		OR	
Q.5	(a)	With a suitable example explain Fano algorithm.	07
	(b)	Write Short note on cryptography.	07

07